MASTER OF SCIENCE
IN
SOFTWARE ENGINEERING

INTERCONNECTIVITY VIA A CONSOLIDATED TYPE HIERARCHY AND XML
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Building a software system that passes any message type between legacy Command, Control, Communications, Computer, Intelligence, Surveillance and Reconnaissance (C4ISR) systems is proposed. The software system presents significant cost savings to the Department of Defense (DoD) because it allows continued use of already purchased systems without changing the system itself.

In the midst of the information age, the DoD cannot get information to the warfighter. The DoD still maintain and use heterogeneous legacy systems, which send limited information via a set of common messages developed for a specific domain or branch of DoD. The ability to communicate with one message format does not meet today's needs, though these stovepipe C4ISR systems will provide vital information. By combining these systems, a synergistic effect on our information operations because of the shared information can be had.

The translator will resolve date representational differences between the legacy systems using a model entitled the Common Type Hierarchy (CTH). The CTH stores the relationships between different data representations and captures what is needed to perform translations between the different representations. The platform neutral extensible Mark-up Language (XML) as an enabling technology for the CTH model is used.

DoD TECHNOLOGY AREAS: Command Control and Communications, Computing and Software

KEYWORDS: Interoperability, Interconnectivity, Legacy Systems, XML, Consolidated Type Hierarchy, Information Systems

**DEVELOPMENT OF A TARGET RECOGNITION SYSTEM USING FORMAL
AND SEMI-FORMAL SOFTWARE MODELING METHODS**
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With the shrinking defense budget, the United States Department of Defense (DoD) has relied more on commercial-off-the-shelf (COTS) and contracted software systems. Government contractors and commercial developers currently rely heavily on semi-formal methods such as the Unified Modeling

Language (UML) in developing the models and requirements for these software systems. The correctness of specifications in such languages cannot be tested, in general, until they are implemented. Due to the inherent safety requirements for mission critical systems, formal specification methods would be preferable. This thesis contrasts the development of a combat system for the Navy using the formal specification language SPEC with development using the semi-formal method UML. The application being developed is a ship recognition system that utilizes image data, detected emitters, and ship positioning to correlate ship identification. The requirements analysis and architectural design for this system are presented.

DoD KEY TECHNOLOGY AREAS: Computing and Software

KEYWORDS: Modeling, Requirements Analysis, Formal Specifications, UML, Formal Methods, Semi-Formal Methods, Target Recognition

SOFTWARE ARCHECTURE RECONSTRUCTION METHODOLOGY IN THE CONTEXT OF PRODUCT LINE
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Software common architecture is widely believed to be a promising product-line approach for significantly improving software development efforts, quality control and time-to-market of the software systems. One of the key efforts to meet our goal of software reconstruction of architecture in the US Army Bradley A3 BFIST program was to manage and trace the requirements of the currently existing software architecture and the new requirements developed for the program. Based on the requirement similarities and matching, software components can be identified for reuse. This effort of requirement management and analysis also gave a clear understanding of the external interface the software components have and the message/data traffic between the components in the system.

This thesis highlights the Software Architecture Reconstruction Methodology of the A3 BFIST program, the programmatic challenges involved, efforts of the Program Managers Office to minimize the project risks regarding the requirements management for software reuse and the lessons learned from the effort. The A3 BFIST Program is a successful project regarding software common architecture reconstruction. Efforts in managing requirements to identify components for software reuse resulted in: Reused software components: 80%; Modified software components: 5%; and New software components: 15 %. The program reduced the risk of cost and scheduling by having this architecture reconstruction process in place.

DoD KEY TECHNOLOGY AREAS: Command, Control and Communications, Computing and Software

KEYWORDS: Software Architecture Reconstruction, Software Reuse for Product Line, Software Management, Risk Management, Software Process Model

SOFTWARE ENGINEERING

STUDY OF A POTENTIAL SINGLE POINT HOUSEHOLD COMMUNICATIONS PRODUCT UTILIZING INTERNET PROTOCOL

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The future of networking technology and the Internet offer a great deal of promise. The potential is forthcoming as newer hardware technology and higher bandwidth capable protocols are designed and implemented. This thesis investigates the possibility of utilizing existing hardware with presently available software to create a practical communication package for the household. The household communication package or home communicator is the network core of the household linking television, telephone, and web browsing capability into one system. The home communicator would receive an incoming television, telephone and Internet signal via optical fiber from a single service provider.

This thesis investigates Linux as the home communicator operating system with Internet Protocol version 6 (Ipv6) as the network protocol. Linux is examined for its proficiency at being a capable customer oriented operating system. Additional Linux compatible applications are studied to include web browsing, e-mail, chat and simple text editing. Finally, Ipv6 was found to be an acceptable software package for the home communicator. There are several major issues preventing an easy solution. A portion of the functionality must be attained through the Internet Service Provider.

DoD KEY TECHNOLOGY: Computing and Software

KEYWORDS: Linux, Internet Protocol, Ipv6